

**INDIANA DEPARTMENT OF TRANSPORTATION  
MATERIALS AND TESTS DIVISION**

**VERIFYING MECHANICAL SHAKERS  
ITM No. 906-02T**

**1.0 SCOPE.**

- 1.1** This test method covers the procedure for verifying the sieving sufficiency of mechanical shakers and the accuracy of timers used in the sieve analysis of aggregates.
- 1.2** The values stated in either acceptable English or SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore each system shall be used independently of the other, without combining values in any way.
- 1.3** This ITM may involve hazardous materials, operations, and equipment. This ITM does not purport to address all of the safety problems associated with the ITMs use. The ITM user's responsibility is to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

**2.0 REFERENCES.**

**2.1 ITM Standards.**

- 571 Quantitative Extraction of Asphalt/Binder and Gradation of Extracted Aggregate from HMA Mixtures.

**3.0 SIGNIFICANCE AND USE.** This ITM is used by laboratory personnel to verify the sieving sufficiency of mechanical shakers and the accuracy of timers used in the sieve analysis of aggregates.

**4.0 APPARATUS.**

- 4.1** Balance, readable to 0.1 g
- 4.2** Stopwatch, readable to 1 s
- 4.3** Sieves, verified in accordance with ITM 902
- 4.4** Sieve pan and lid

## **5.0 PROCEDURE.**

### **5.1 TIMER.**

- 5.1.1** Operate the mechanical shaker with the timer set at 5 min, and measure the time using the stopwatch.
- 5.1.2** Repeat 5.1.1 with the timer set at 10 min and 15 min.
- 5.1.3** If the timer is not within the allowable tolerance of 7.1, the manufacturers markings shall not be used, and accurate settings on the shaker shall be established by trial and error determination.

### **5.2 SHAKERS USING 8 in. (203 mm) AND 12 in. (305 mm) DIAMETER SIEVES.**

- 5.2.1** Determine and record an initial sample weight (mass) that meets the minimum requirements of the Standard Specifications or ITM 571.
- 5.2.2** Insert sieves No. 4 (4.75 mm) through No. 200 (75  $\mu$ m) for sands or 1 in. (25 mm) through No. 200 (75  $\mu$ m) for blended aggregates into the shaker.
- 5.2.3** Shake sample mechanically for 15 min for sands or 10 min for blended aggregates.
- 5.2.4** Place the first sieve retaining material on a pan, and cover the sieve with the lid.
- 5.2.5** Hand shake the first sieve for 1 min by holding the sieve in a slightly inclined position in one hand and striking the side of the sieve sharply and with an upward motion against the heel of the other hand at approximately 150 times per min. The sieve should be turned about 1/6 of a revolution at intervals of about 25 strokes. For sieves larger than the No. 4 (4.75 mm) sieve, the material on the sieve should be limited to a single layer of particles.
- 5.2.6** Weigh the material passing the sieve and retained in the pan.
- 5.2.7** Weigh the material retained on the sieve.
- 5.2.8** Add the weight (mass) retained on the sieve and weight (mass) passing the sieve, and verify the sieve was not overloaded in accordance with Table 1. If the sieve was overloaded, verification is void, and a new sample shall be obtained.
- 5.2.9** Repeat 5.2.5 through 5.2.8 on all remaining sieves.
- 5.2.10** If a sieve does not meet the allowable tolerance of 7.2, the shaking time shall be increased to determining an adequate time.

**5.3 SHAKERS USING 15 in. x 23 in. (375 mm X 578 mm), 14 in. x 14 in. (356 mm X 356 mm), OR OTHER SIZE SIEVES.**

- 5.3.1** Determine and record an initial sample weight (mass) of an aggregate having a nominal aggregate size of 3/4 in. (19.0 mm).
- 5.3.2** Insert sieves 1 in. (25 mm) through No. 8 (2.36 mm) into the shaker.
- 5.3.3** Shake sample mechanically for 5 min.
- 5.3.4** Remove the first sieve retaining material, determine the weight (mass) of material retained, and verify that the sieve was not overloaded in accordance with Table 1. If the sieve was overloaded, verification is void, and a new sample shall be obtained.
- 5.3.5** Place the material on a 8 in. or 12 in. (203 mm or 305 mm) diameter sieve of equivalent opening size in increments that will not overload the sieve in accordance with Table 1. Place the sieve on a pan and cover the sieve with the lid.
- 5.3.6** Handshake for one min as described in 5.2.5. Continue until all material has been introduced onto the 8 in. or 12 in. (203 or 305 mm) sieve.
- 5.3.7** Weigh the accumulated material passing the sieve and retained in the pan.
- 5.3.8** Repeat 5.3.4 through 5.3.7 for all remaining sieves.
- 5.3.9** If a sieve does not meet the allowable tolerance of 7.2, the shaking time shall be increased to determine an adequate time.

**6.0 CALCULATIONS**

The percent passing a sieve by hand shaking after mechanical shaking is calculated by the following formula:

$$\% \text{ Passing} = \frac{W1}{W2} \times 100$$

Where:

W1 = Weight (mass) of sample passing a sieve by hand shaking, g

W2 = Initial sample weight (mass), g

**7.0 TOLERANCE.**

- 7.1** The timer of the mechanical shaker shall be within  $\pm 5$  s at 5 min,  $\pm 10$  s at 10 min, and  $\pm 15$  s at 15 min of the stopwatch reading.
- 7.2** After mechanical shaking, no more than 0.5 percent by weight (mass) of the total sample shall pass any sieve after 1 min of hand sieving.

**TABLE 1**  
**APPROXIMATED SIEVE OVERLOAD**

Screen Size	Standard 15" X 23" (372 X 580 mm) kg	Standard 14" X 14" (350 X 350 mm) kg	12" (304.8 mm) Diameter	8" (203.2 mm) Diameter
3 in. (75 mm)	40.5	23.0	12.6 kg	-----
2 in. (50 mm)	27.0	15.3	8.4 kg	3.6 kg
1 ½ in. (37.5 mm)	20.2	11.5	6.3 kg	2.7 kg
1 in. (25.0 mm)	13.5	7.7	4.2 kg	1.8 kg
¾ in. (19.0 mm)	10.2	5.8	3.2 kg	1.4 kg
½ in. (12.5 mm)	6.7	3.8	2.1 kg	890 g
3/8 in. (9.5 mm)	5.1	2.9	1.6 kg	670 g
No. 4 (4.75 mm)	2.6	1.5	800 g	330 g

8 in. (203.2 mm) diameter sieves, No. 8 to No. 200 (2.36 mm to 75 µm) shall not exceed 200 g/sieve

12 in. (304.8 mm) diameter sieves, No. 8 to No. 200 (2.36 mm to 75µm) shall not exceed 469 g/sieve

**MECHANICAL SHAKER AND TIMER  
VERIFICATION  
ITM 906**

**SHAKER IDENTIFICATION**

Manufacturer: \_\_\_\_\_ Mod. No.: \_\_\_\_\_  
Serial No.: \_\_\_\_\_

**VERIFICATION EQUIPMENT USED**

Balance: \_\_\_\_\_ Have sieves been verified using ITM 902? \_\_\_\_\_

**TIMER VERIFICATION**

Setting on Shaker Timer	Timing Device Reading	Corrective Adjustment Made
5	_____	_____
10	_____	_____
15	_____	_____

**SIEVING SUFFICIENCY VERIFICATION**

Frame Dimensions: \_\_\_\_\_ Mechanical Sieving Time: \_\_\_\_\_  
Total Sample Weight (mass): \_\_\_\_\_

Sieve Size	Weight (mass) Retained by Mechanical Sieving	Weight (mass) Passing After Hand Sieving	% Passing After Hand Sieving
1 in. (25.0 mm)	_____	_____	_____
¾ in. (19.0 mm)	_____	_____	_____
½ in. (12.5 mm)	_____	_____	_____
3/8 in. (9.5 mm)	_____	_____	_____
No. 4 (4.75 mm)	_____	_____	_____
No. 8 (2.36 mm)	_____	_____	_____
No. 16 (1.18 mm)	_____	_____	_____
No. 30 (600 µm)	_____	_____	_____
No. 50 (300 µm)	_____	_____	_____
No. 100 (150 µm)	_____	_____	_____
No. 200 (75 µm)	_____	_____	_____

Remarks: \_\_\_\_\_  
\_\_\_\_\_

Verified by: \_\_\_\_\_

Date: \_\_\_\_\_ Next Due Date: \_\_\_\_\_